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Quality of communication between dentists and dental technicians for fixed and removable prosthodontics

Hana M. Al-AlSheikh

Department of Prosthetic Dental Science, College of Dentistry, King Saud University, P.O. Box 60169, Riyadh 11545, Saudi Arabia

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Abstract *Objective:* The aim of this study was to evaluate the quality of communication between dental practitioners and dental technicians through work authorizations and selection of impression trays and materials for both fixed and removable prosthodontics in the Dental College of King Saud University.

Methods and materials: A questionnaire was distributed to the dental technicians concerning the quality of written instructions in the work authorization form. Use of impression trays and materials for fixed and removable prosthodontics, were part of the questionnaire. Out of two hundred distributed questionnaires, 136 were received (response rate = 68%). Using pre-determined grading criteria.

Results: The findings showed that half of the written instructions were considered “clear”, out of which 34% the technician had to seek clarification from the dentist concerning the written instructions which reveal inadequate prescription. The special tray was the most common choice of impression tray (53.8%) and the elastomers were the most common impression material used (71%) for both fixed and removable prosthodontics. The technicians were certain that the final impression had been disinfected in only 81% of cases.

Conclusion: This study showed that it is worth emphasizing that clear and effective communication about design information is essential to ensure fabricating good quality fixed and removable prostheses.

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1. Introduction

The field of dentistry is evolving rapidly. At the same time there is an increase in the patient's knowledge and needs,

which requires an interactive relationship between dentists and dental technicians for achieving a successful outcome. The American dental association [3] has issued guiding principles to improve the relationship between the dentist and the dental technician. Clear effective communication of design features between dental practitioners and dental technicians has long been recognized as a main factor that contributes to the production of high quality fixed and removable prostheses [7,17,1]. Insufficient design information to the technician results in a prosthesis that is constructed with an inadequate consideration to important clinical and biological factors and

E-mail address: drhana6@gmail.com

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this can cause tissue damage [20,15,16]. The problems of inadequate designs information, or inadequately communicated designs, are not new to dentistry. They were first highlighted over 30 years ago, and have been demonstrated in many countries including the United Kingdom [4,24]; Sweden [30], Canada [31], South Africa [8], USA [28], Ireland [14], Japan [27] and recently in the Kingdom of Bahrain [21]. This problem seems to relate to both fixed and removable prostheses and has been attributed to financial and educational issues [15,16]. The dentist's responsibilities are not only to provide clear written instructions to the technician, but also to deliver accurate impressions and appropriate infection control measures before sending materials to the dental laboratory. The final impression should be made of a dimensionally stable elastomeric material by using a modified metal stock tray or a rigid special tray [15,16].

Goodacre [9] presented the responsibilities of the dental practitioners toward the dental laboratory technician and stated definite recommendations for dental educators to deal with the consequences in future.

Inadequate communication between dentist and dental laboratory technicians has been recognized widely in the literature [11,22,9,15,16,1,21,12]. There have been no previous studies conducted to evaluate the quality of communication between the dental practitioners and dental technicians in the Kingdom of Saudi Arabia.

The purpose of this study was to assess the quality of communication between dental practitioners and dental technicians through work authorizations and the selection of impression trays and materials for both fixed and removable prosthodontics in the Dental College of King Saud University.

2. Materials and methods

A self-administered questionnaire was constructed and distributed to the dental laboratories in the Dental College, King Saud University (Fig. 1). Information was obtained in relation to the quality of written instruction in the work authorization form and the level of communication between dental practitioners and dental technicians. The used questionnaire was designed to give more details than what is available in literature concerning fixed and removable prosthodontics. The questionnaire included questions such as: dental practitioner category, type of prosthodontics, patient's age and gender, return date, choice of impression trays and impression materials used for fabrication of fixed partial dentures (FPDs) and removable partial dentures (RPDs), disinfection status of the impression, and an important design feature for each prosthodontics in two separate sections related to the type of the case.

The quality of the written instructions that was obtained from the work authorization was classified as:

Clear—the instructions were clear and definite, no need for communications with the dentist.

A guide—minor changes on the design have been left to the technician, and communication was made with the dentist to clarify some of the instructions.

Poor—major changes on the design have been left to the technician, and communication was made with the dentist to clarify most of the instructions.

None—no design instructions were available.

In addition to, if technician needed to contact the dentist for clarification of the design and if the clinician approached the technician to discuss the design.

The questions were reviewed by some faculty members and statistician before distributing it.

Responses were tabulated and converted into percentage using Statistical Package for the Social Sciences (SPSS) version 16. Descriptive statistics are reported.

3. Results

Two hundred questionnaires were distributed. One hundred and thirty-six questioners were completed and returned with a response rate of 68%. Out of these, 50 (36.8%) questionnaires were related to fixed prosthodontics, 71 (52.2%) related to removable prosthodontics and 15 (11.0%) related to combination cases of fixed and removable prosthodontics. Within the written instructions, the dental practitioners were 37 (27.2%) specialists, 7 (5.1%) postgraduates (PG), demonstrators (Demo) and general practitioners (GP), 19 (14%) interns and 73 (53.7%) students. The types of prosthetic treatment are shown in Table 1. The age was indicated in 69.1% ($n = 94$) of the cases, while the gender was identified in 78.7% ($n = 107$), and the return date was indicated in 83.1% ($n = 113$) of the cases. The most common choice of impression tray was the special tray 53.8% ($n = 85$) and the elastomers were the most common impression material used (71% $n = 109$). The combinations of impression trays and materials selected for fixed and removable prostheses are shown in Table 2.

Nineteen per cent of the impressions ($n = 24$) were visibly contaminated with blood and saliva or some attached debris. In two cases (1.5%), the technicians were uncertain if the impression had been adequately disinfected. Eighty-one per cent of the technicians involved in this study ($n = 105$) were certain that the final impression had been disinfected. The quality of the written instructions was evaluated by 125 out of 136 respondents as shown in Fig. 2. They reported that: 49.6% ($n = 62$) were clear, 40.8% ($n = 51$) were a guide and some of the designs were left to the technician, 7.2% ($n = 9$) were poor and left most of the responsibilities for the design to the technician, and 2.4% ($n = 3$) had no written instructions (Fig. 2).

Table 3 shows the distribution of these written instructions according to the case category. In 34% of cases ($n = 42$), the dentists were asked to clarify the design prior to making the prosthesis. Several reasons were given for this including incomplete instruction, shade and design required, complicated cases and some others.

Within the written instruction of the fixed prosthodontics, the metal alloy was indicated in 74% of cases ($n = 57$), the design of the margin was indicated in 86% of the cases ($n = 55$), the number and design of the pontics were indicated in 80% of cases ($n = 28$), the dentists had specified the surface that will be covered with metal only in 89% of cases ($n = 57$), occlusal scheme was indicated in 95% of cases ($n = 61$), the shade was indicated in 96% ($n = 63$) while the staining diagram was identified in 72% of the cases ($n = 46$) also the type of porcelain glaze was specified in 73% of cases ($n = 47$).

Regarding the removable prosthodontics the results showed that dentist designed the RPD in 95% ($n = 39$) of the cases,

From the work authorization form:

1. Case for:
Specialist ____ PG/Demo/GP ____ Intern ____ Students ____

2. Type of case:
* Fixed prosthodontic ____
Post&core ____ Crown ____ Fixed partial denture ____ Others ____
* Removable prosthodontic ____
RPD ____
(Conventional ____ Temporary ____)
Complete denture ____ Others ____

3. Is the age indicated?
Yes ____ No ____

4. Is the gender indicated?
Yes ____ No ____

5. Is the return date indicated?
Yes ____ No ____

Regarding the master impression:

6. What type of impression tray has been used?
Plastic stock tray ____ Metal stock tray ____ Special tray ____

7. What type of impression material has been used?
Alginate ____ Elastomers ____

8. Has the master impression been disinfected adequately by the dentist?
Yes ____ No ____
If "No", please comment on how you know it has not been disinfected adequately?

Regarding the written instructions:

9. Please tick the appropriate statement, the written instructions are

- Clear, and adequately describe the planned Prosthesis ____
- A Guide, and some of the design is left to the technician ____
- Poor, and most of the design is left to the technician ____
- There are no written instructions ____

10. Will you need to contact the dentist for clarification of the design prior to making the Prosthesis?
Yes ____ No ____
If "Yes", why is this? _____

In case of Fixed Prosthesis:

11. Is the metal alloy indicated?
Yes ____ No ____

12. Is the design of the margin indicated?
Yes ____ No ____

13. Are the number of pontics and design indicated?
Yes ____ No ____

14. Has the dentist specify which surfaces are to be covered by metal only
Yes ____ No ____

15. Is the occlusal scheme indicated?
Yes ____ No ____

16. Is the shade indicated?
Yes ____ No ____

17. Has the dentist provide a diagram for staining?
Yes ____ No ____

18. Has the dentist indicate the type of porcelain glaze?
Yes ____ No ____

In case of Removable Prosthesis:

19. For RPD, is there a design diagram?
Yes ____ No ____

20. Is it color coded
Yes ____ No ____

21. Is the shade of the artificial teeth indicated?
Yes ____ No ____

22. Has the dentist indicate the type of the occlusal scheme?
Yes ____ No ____

23. Has the dentist carve the posterior palatal seal?
Yes ____ No ____

24. Is there information on the finishing and contouring of the acrylic work?
Yes ____ No ____

25. In case of Temporary RPD has the dentist indicate the teeth to be clasped?
Yes ____ No ____

For any type of prosthesis

26. Does the clinician approach you to discuss the design of the case?
Yes ____ No ____
If Yes, how often:
- Always ____ occasionally ____ Upon request ____ Never ____

Figure 1 Survey questionnaire.

However only 56% ($n = 23$) were color coded. The shade indicated in 82% ($n = 70$) of cases, while occlusal scheme indicated in 64% ($n = 54$) of cases. The carving of the posterior

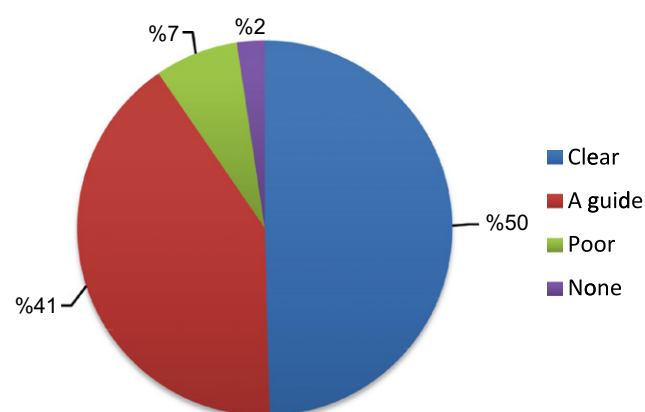
palatal seal was made in only 41% ($n = 7$) of cases with complete dentures by the dentist. 62% ($n = 53$) of the cases had information about the finishing and contouring of the

Table 1 Description of prosthodontic treatment.

	Post & core		Crowns		FPDs		RPDs Conv.		RPDs Temp.		Complete dentures		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Fixed prostheses	12	(7.4)	19	(11.7)	26	(16.1)							57	(35.2)
Removable prostheses							41	(25.3)	13	(8.0)	17	(10.5)	71	(43.8)
Combined cases	1	(0.6)	10	(6.2)	9	(5.6)	14	(8.6)					34	(21.0)
Total	13	(8.0)	29	(17.9)	35	(21.7)	55	(33.9)	13	(8.0)	17	(10.5)	162	100%

Table 2 Combination of impression tray and materials selected for fixed and removable prostheses.

	Alginate						Elastomer						Total	
	Plastic stock tray		Metal stock tray		Special tray		Plastic stock tray		Metal stock tray		Special tray			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Fixed prostheses	5	3.2	3	1.9	0	0	13	8.2	12	7.6	24	15.2	57	36.1
Removable prostheses	4	2.5	5	3.2	16	10	5	3.2	5	3.2	36	22.8	71	44.9
Combined cases	7	4.4	5	3.2	4	2.5	2	1.3	7	4.4	5	3.2	30	19
Total	16	10.1	13	8.3	20	12.5	20	12.7	24	15.2	65	26	158	100

**Figure 2** Quality of written instructions for all prosthodontics cases.

acrylic prosthodontics. In 77% ($n = 10$) of temporary partial denture cases the dentist indicated the teeth to be clasped.

In 55% ($n = 68$) of the cases the clinicians approached the technicians, out of which 50.8% ($n = 33$) happened occasionally, 38.5% ($n = 25$) for upon request and only 10.8% ($n = 7$) for always.

4. Discussion

The results of this study showed some aspects of communication between dental practitioners and dental technicians at the

Dental College, King Saud University in the field of fixed and removable prosthodontics. It was found that half of the written instructions 49.6% ($n = 62$) were considered “clear”. Out of which 34% of the technicians had to approach the dentists to clarify some of the written instructions. This might reveal inadequate written instruction and communication between clinician and laboratory technicians. Which might be due to the fact that the dentist depends on the dental technician to construct the prostheses in specific manner and design, or the dentist interested in writing certain information in the work instruction form over other information. Also it could be due to weak undergraduate training in writing laboratory instructions [1]. Notwithstanding this, the results of this study were comparable, if not slightly better than that observed in other studies [4,28,5,14–16,10,21,12].

Lynch and Allen [15,16] mentioned important guidelines for designing fixed and removable partial dentures, the crown and bridgework require writing instruction in details and the design of removable partial denture is the duty of the clinician. Despite the introduction of these guidelines, the dental practitioners have the clinical, legal and an ethical responsibilities to design, and communicate design features adequately for good quality prostheses that will not cause harm to oral structures. In this investigation, 41% only of the necessary parameters were indicated in the work authorization for fixed prosthodontics, while for removable prosthodontics were 50% only to complete the task. Although, in 96% of the fixed restoration, the shade was indicated, 72% provide a diagram for staining and 73% were indicated the type of porcelain glaze.

Table 3 Written instructions quality classified according to the type of prosthodontic case.

	Clear		A guide		Poor		None		Total	
	N	%	N	%	N	%	N	%	N	%
Fixed prostheses	19	15.2	21	16.8	1	0.8	0	0	41	32.8
Removable prostheses	34	27.2	28	22.4	6	4.8	2	1.6	70	56
Combined cases	9	7.2	2	1.6	2	1.6	1	0.8	14	11.2
Total	62	49.6	51	40.8	9	7.2	3	2.4	125	100

Using a diagram of a tooth for multiple shades is very helpful to the dental technician, especially in the fabrication of crowns in the anterior region, and indicating the type of porcelain glaze such as auto glazing, over glazing, or polishing [23,1]. Unlike other studies [28,15,16,21] which showed that the majority of the removable partial denture (RPD) cases were designed by the dental technician, this study showed that 95% of the removable partial denture (RPD) cases were designed by the dental practitioners. This is expected since this survey study was in the dental school and most of the cases were for undergraduate students in an educational environment, and the lab prescription form had boxes for different choices that the dentist may choose this would make communications more clear. While the other studies' data were from commercial laboratories. However, only 56% of RPD cases in this study were the design diagrams color coded. It is clear that the dentist and the dental technician should utilize similar terminology to be able to have good communication. They could use color coding to mark the different components of RPD. Computerized RPD systems give the potential of having an excellent on-line communication between dental clinics and dental laboratories [7].

The results of this study showed that some of important parameters in removable prosthodontics were left to the dental technician decision such as type of occlusal scheme 36% ($n = 31$), carving of posterior palatal seal 59% ($n = 10$), information on finishing and contouring of the dental prosthesis 38% ($n = 32$). Due to insufficient education, dentists depend on dental technicians to design the dental prosthesis which is not an acceptable practice. The design of any prosthesis involves mechanical and biological principles, and the technicians usually lack the information about these aspects which might lead to a faulty design of the prosthesis [29,15,16].

It is very essential to have an accurate impression to be able to construct a good prosthesis [25,19].

In this study the most commonly used impression tray was a special tray and the most commonly used impression material was the elastomeric material for both fixed and removable prostheses. These results were satisfactory and following the previously mentioned guidelines. Therefore, the findings of the present study regarding the impression tray and impression material differ from those presented by Lynch and Allen [15,16], 2006 and Radhi et al. [21]. Lynch and Allen [15,16] found that plastic stock trays were widely used for recording one-half of the final impressions for fixed and removable prosthodontics, and that impressions received by dental laboratories were not properly disinfected. Furthermore, Lynch and Allen [15,16] and Radhi et al. [21] found that alginate impression material was most commonly used for final impressions for removable partial dentures, which were poured after 24 h. It was shown in this study that both saliva and blood were visible on 19% of examined impressions. This finding is similar to that obtained by other reported studies [15,16]. However, Al-Kheraif and Mobarak [2] found in their study of the infection control practice in the private laboratories in Riyadh city, that "only 9.4% of the laboratories reported that they receive disinfected impressions and were informed through notification labels, while 90.6% of the laboratories did not have any communication with the clinics regarding the disinfection procedures". It was reported that non-disinfected impressions are able to transmit microorganisms to dental laboratory technicians [26,13].

The dental laboratory technicians are important members of the dental health team. The interaction between dentists and dental laboratory technicians has been termed a "love-hate relationship", and the laboratory work authorization has been called the most frequently used and abused form of communication between them [18]. Christensen [6] suggested the following concepts for dentist and technician to improve dentist-technician integration and communication and, ultimately, to improve patient care:

- 1- Attending continuing education courses together.
- 2- Holding private meetings.
- 3- Increasing the quality and scope of communication in laboratory orders.
- 4- Incorporating technicians into dental practices or buildings.
- 5- Making postoperative telephone calls to technicians.
- 6- Initiating or joining study clubs or joining dental organizations that include both dentists and technicians.
- 7- Promoting integrated education of dental and laboratory technology students.

Finally, the results of this study can be a base for further studies that are recommended to be conducted in other dental schools and dental centers in Saudi Arabia to reveal more detailed information about the quality of communication between dental technicians and dentists.

5. Conclusion

It can be concluded from the findings of this study that:

- 1- Quality of the written instructions for fixed and removable prosthodontics was inadequate.
- 2- The mostly used impression material was elastomeric materials with the use of special tray for fixed and removable prosthodontics.
- 3- More than nineteen per cent of impressions that were sent to dental laboratories showed visible contamination.

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